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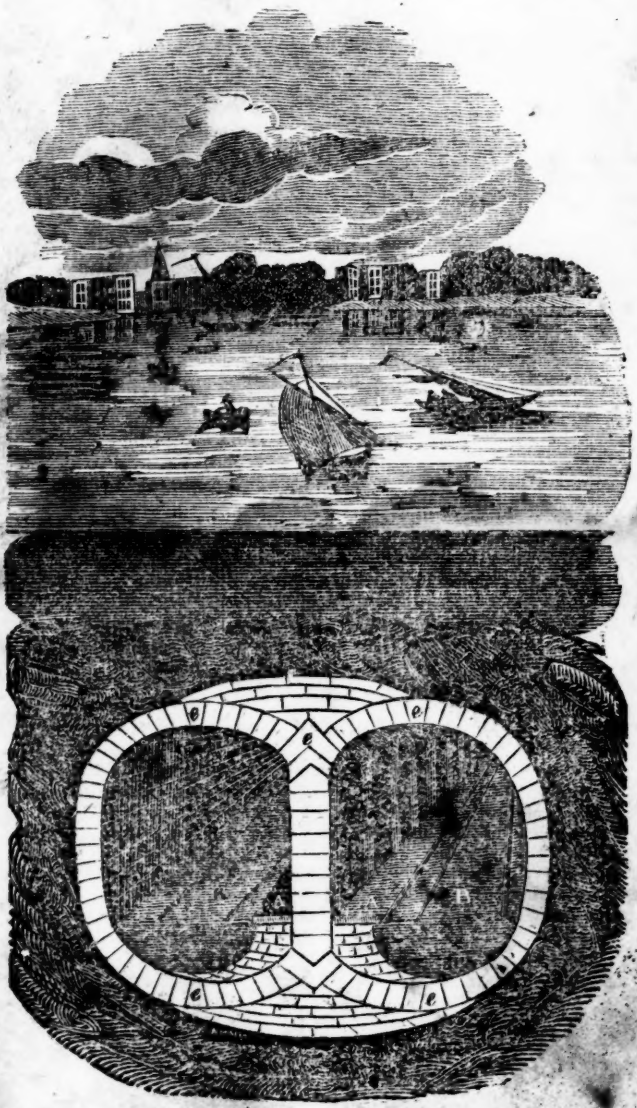

From the Lond. Mechanics' Register.

MR. JOHNSON'S PLAN FOR A TUNNEL UNDER THE THAMES.

SIR,—Observing in your valuable publication a plan for building a Tunnel under a river, by Mr. Dewhurst, who proposes to erect it by driving piles to form a *coffer-dam*, I think it necessary to state that a similar suggestion was laid before the Society of Arts, Adelphi, in the year 1821, and published by me in a periodical work, on the 20th December 1823. I inclose for your perusal the number in which my plan was inserted, and beg to make the following objections to Mr. D.'s plan, as delineated in your Engraving, which I take for granted, is correctly copied from his drawing. I think, indeed, that Mr. D. can never have seriously considered his plan, and am sorry that he has committed the judgment of his three scientific friends who are gone to Mexico.

First, the stones on the upper part, or top of the Tunnel are shaped wrong, and would not support their own weight. They should be wedge-shaped as at *e e e* in the accompanying drawing, in which A represents the footpath (3 feet wide,) and B, the carriage road (15 feet wide.)

Second, the sides of the Tunnel, if upright or flat, would be forced in by the great pressure on the outside, and the pillars would be broken by the lateral pressure. The tunnel that I proposed has pillars in the centre, and also on the sides.

Third, the bottom would be forced, or what is called blown up.

Fourth, the loose earth, instead of strengthening the top, would have a directly contrary effect.

Fifth, the tunnel could not be laid in a quicksand; the bottom of the sewer, in the New Kent Road, was made of cast iron on that account.

Sixth, timber could not be procured of sufficient length for the piles. The nearest place at which a tunnel is wanted is Blackwall. Now, if we take 32 feet as the depth of the river in the middle at high water, the length of the piles may be calculated as follows:—

Depth of the river	32 feet.
Earth over the tunnel	5
Thickness of stones	3
Height of tunnel	18
Piles below the bottom, to insure their stability	10
Total length of piles	68 feet.

The plan of the tunnel at Rotherhithe is good, if it can be executed: and the expense of the requisite machinery is not so great as Mr. D. appears to conjecture.

As the tunnel now erecting under the Thames is to be constructed of brick, the following questions are, I think, of considerable importance:—

1. If the depth of the river be 30 feet, what is the pressure of the water upon every foot of a tunnel 24 feet wide; and what is the pressure, if the tunnel be 32 feet in width?

2. What is the pressure of earth, 15 feet thick, on each respectively?

3. What should be the thickness of the pillars and arch, to enable them to resist the great pressure of water and earth?

4. What was the cause of the Highgate tunnel falling in?

5. What is the best form of an arch for a tunnel, constructed of brick?—ditto of stone?

6. What is the best form for one constructed of cast iron?

7. What is the most eligible mode of ascertaining by experiment, on a small scale, the best form of an arch?

As the arches of bridges differ very materially from each other, it would seem that architects are not agreed as to the best form, or whether it should be semicircular, eliptical, catenarian, &c. There is a great difference between a bridge and a tunnel, as it regards the arch. The bridge has only to support its own weight, and that of the carriages, &c.; but the tunnel will have to support both the earth and the water above it One cubic foot of fresh water weighs 62 1-2 lbs., and at high water there will be above 25 feet at Rotherhithe; besides which there will be 30 feet of clay, and the tunnel is to be 35 feet wide. Can bricks, if made of the common or ge-

neral form and texture, support such a weight?

Yours, J. Johnson.

From the Kaleidoscope.

HANGING GARDEN.

The politeness of a gentleman now in Liverpool, has enabled us to publish, we believe for the first time, an account of a great curiosity which is to be seen at Limerick, and which we believe to be unique in Great Britain.

We have called it a hanging garden, because it is constructed on the same principle as the celebrated hanging gardens of Babylon, of which we have also given a description in the present number.

Limerick, Sept. 2, 1825.

Sir,—Agreeably to the wish you expressed when walking over my garden with my brother and me yesterday, I beg to give you a brief description of those gardens and of the causes which induced me so to construct them. The line of business, that of bankers, in this city, which my brother and I follow, in partnership, requiring much attention, induced me to think of devising some mode of personal and mental recreation, without the inconvenience of absenting myself from my place of business and residence. I therefore acquired some ground to the rear of my dwelling house, with the view of extending the garden or pleasure ground originally apertaining to it. In accomplishing this object however, a lane or public passage intefered, which, as I could not shut up or interrupt, it suggested itself to me to raise an arch over it, whereby to keep the passage underneath still free; and, in order to elevate the continuation or additional rear ground to a level with the arch over the public passage. I decided upon raising it by arches likewise. I first prosecuted this plan on a smaller scale, but finding that I could render the interior of those arches peculiarly eligible, as public stores, for holding wines, spirits, or other articles, and that the Government of this country would speedily require such stores in order to accommodate the merchant or distiller with the privilege of placing (or bonding, as it is officially called) their stock until the King's duty should be paid, induced me to enlarge the plan I first contemplated, in order to render the stores sufficiently capacious for those public purposes. In thus extending them I varied the elevation of the arches, both with a view of enlarging the storage part underneath, and of diversifying the garden above into different elevations or terraces. Some of these arches, namely, the two side ones, are nearly forty feet high from the street, in front of the facade of the stores, and the terrace; or portion of the garden over them, proportionably elevated. The terrace, or division between the two side ones, is a few feet lower than the latter, and the middle part of the garden considerably lower, but still elevated twenty five feet from the ground surface of the stores. The side or highest afford opportunity of three stories, or interior divisions, or lofts; the centre one two such stories or lofts, and the low or middle arches are confined to one story. All these elevated terraces are ornamented with forcing hot houses, warmed by glass and flues; some being adapted for peaches and other delicate fruit trees, some for pine apples, some for vines, and the remainder as orangeries and conservatories; the hot houses &c. being united in the angles and centre by globular green houses or conservatories. The part of the garden nearest my dwelling house is devoted to flowers; the main or middle part to vegables, hardy fruit trees, &c.; this middle part swelling considerably on each side as you advance from the flower knot, and the walks bordered likewise with flowers as well as small shrubs. The terraces are occupied by the hot houses, &c. as before described; the borders thereof being appropiated to vegatables and espaliers for fruit trees. The ascent to the different

terraces is effected by various flights of steps from one elevation to another. The garden commands various views of the city and public streets (being built almost in the centre of the fashionable part of Limerick) besides possessing an extensive prospect of the river Shannon, its commerce, villas, and buildings on both sides. Annexed to the garden is a vacant space or yard, raised likewise on arches, which I appropiate to forcing melons, cucumbers, &c. The arches (two in number) being thus applied, the upper arch for the reception of hot-houses frames, and other conveniences, the undermost or ground arch to a military guard house for the protection of the stores; the whole of which are rented from me, by the King's Government, at 300*l.* sterling per annum, besides a sum of money paid me in hand. The stores are capable of containing from fifteen hundred to two thousand hogsheads of wine, spirits, or other liquids, and any other article in proportion. Those stores are peculiarly adapted to public utility and safety, being secured from fire by the nature of their construction, from plunder by their strength and solidity, and from the waste or evaporation of any liquids deposited in them by the evenness of temperature that almost always exist there, from the close texture of the building, and the body of earth or garden surface over head. The building of this combined structure occupied me about five or six years, as it was too delicate a work to continue during the winter months; and it is now about seventeen years since I commenced the undertaking, having began it in the year 1808.

The whole forms rather an *unique* association of the useful, the profitable, and agreeable, and is considered an object of curiosity to the citizens of Limerick, and to the strangers who pass through it.

Happy to oblige you, and to add my testimony to the universal feeling of respect which the citizens of Limerick, as well as of the many other parts of Europe which you have visited, entertain, not only for your talents, but still more for the many amiable and benevolent traits of your character.

Yours respectfully,

WILLIAM ROCHE.

P. S.—The whole occupies more than an English acre of ground. The side terraces are one hundred and fifty feet long by thirty feet wide, each; the central terrace one hundred and eighty feet long by forty feet wide; and the lower or middle garden about two hundred feet long by one hundred feet wide, exclusive of the melon or cucumber ground, which is about eighty feet square. The top of the terrace walls is seventy feet high from the subjacent street, and as high or higher than the tops of the surrounding houses. The general appellation or designation of the place is "Mr. Roche's Elevated Gardens." The front or facade of the building opposite the Bishop's and the Earl of Limerick's house extends above two hundred feet, and presents a view of the various elevations of the arches, as well as a partial view of the garden over head.

This structure and its accompaniments cost me nearly 15,000*l.*; but I received from the King's Government, namely, through the Excise and Custom's department of Ireland, nearly 10,000*l.* in ready money, exclusive of the rent of 300*l.* a year.

Limerick, Sept. 3, 1825.

SIR,—As you wish for every information respecting my gardens it occurs to me to add, that the depth of earth, or garden surface, is, on the average, about five feet; and that the stores underneath are protected from the penetration of rain or moisture by flags cemented together, and by various channels formed of lead, which convey the redundant moisture (after the garden soil is saturated) into perpendicular tubes of lead concealed in the abutments of the arches, and thence by horizontal sewers to the main sewer of the street and to the river. These sewers and channels possess also the advantage of enabling

me, in summer, or in dry weather, to retain the rain water from passing off by stopping the communications with the perpendicular tubes, whereby the water is repelled into the different channels under the garden surface, and, consequently, continues to feed the garden soil, or earth, with moisture, until rain falls again, when any superfluity can at once be allowed to escape. It therefore possesses advantages in this respect which a natural garden cannot command. I also procure a constant supply of rain water, by conveying into cisterns, in the forcing houses, the rain which falls on the glass sashes that are in front of those forcing houses. I have likewise mechanical means to get up manure, and other conveniences, which render the labour less than if the gardens were on the natural or ground surface.—Believe me again, dear Sir, (with compliments to Mrs. Alexandre,) Yours, respectfully,

WILLIAM ROCHE.

P. S. In consequence of the different terraces or elevations in my garden, it affords more than double the quantity of wall for fruit trees that a garden of the same dimensions on the natural ground could supply.

From the Caledonian Mercury.

STRENGTH OF LEADEN PIPES.

Some curious and interesting experiments on this point have recently been made by Mr. Jardine, engineer, at the Water Company's Yard in Heriot's Green, Edinburgh, with the view of determining accurately the proper strength or thickness of metal to be given to the pipes intended for conveying water to different parts of the city. This is an important subject, and one regarding which practical men have hitherto been much in the dark. The observations, therefore, set on foot by this distinguished engineer cannot fail to be of great utility, and we hope the particulars of them will be communicated to the public: for it happens in this, as well as in many other branches of mechanics, that a few judicious and careful experiments, in one or two particular instances, are sufficient to comprehend a vast variety of cases which are continually occurring in practice. The strength of pipes, for example, even those of the same thickness of metal, varies gently with the calibre of each. The pipe, in fact, becomes weaker exactly as its, calibre, or internal diameter, is enlarged Hence it is quite unnecessary to make trials of all the different sizes of pipes, as one observation of any particular diameter and thickness of metal affords a rule for computing the comparative strength of pipes of any other dimensions whatever. The following are the results of two of the above experiments.

The manner of making the trial is this—the pipe to be tried is closed at one extremity, while the other communicates with a forcing pump, by means of which water is thrown into it and forced, until it presses the pipe on all sides with a violent pressure, in the same manner as if the pipe were conveying the water of a lofty spring, the effect of which is to press out the pipe on all sides in proportion to the height of the fountain-head. But the pump is also furnished with a valve or guage which measures exactly the degree of pressure communicated to the pipe, so that, in every experiment, we can compute the height of the resevoir which would have caused a similar pressure by the water conveyed from it, and in this manner obtain a rule for adapting the strength of each pipe to the pressure which its situation subjects it to. When the water from the pump first begins to press out the pipe, little or no alteration is observed on it for some time; as the operation of forcing proceeds, however, and the pressure thereby becomes increased, the pipe gradually swells through its whole length, until at last a small protuberance is observed rising in some weak part, which continues increasing until the substance of the metal, becoming gradually thinner and thinner, is at last fairly rent asunder, when the pipe bursts with a crash, and the water issues with great vio-

lence. In the first experiment the pipe was 1¼ inch bore, and the metal, which was remarkably soft and ductile, was one-fith of an inch in thickness. This was forced, as above described, until the pressure became equivalent to that of a spring or column 1000 feet high, which is equal to 30 atmospheres, or 420lbs. on every square inch of the pipe. This it sustained without alteration, but with a pressure equal to 1200 feet it began to swell, and with 1400 feet, or 600lbs. on the inch it burst. It appears surprising that the soft material of lead should sustain so enormous a pressure, but this arises from its being equally distributed through every part of the mass. There is no cross strain nor unequal action in different parts of the pipe, but a fair stretch throughout the whole surface, which it is well-known is by far the most favourable situation for strength. On measuring the above pipe after the experiment, it was found to have swelled out from 1¼inch to 1¾. so that a part of the original pipe, which had not been subjected to any pressure, could be inserted within the fractured piece. The fracture of this piece presented a very striking appearance. The edges were no way ragged, but quite smooth and sharp, like a knife, showing how the metal had been gradually distended and thinned out to nothing by the internal pressure, as if the pipe had consisted of soft clay or wax. In the second experiment, the pipe was two inches diameter and one fith of an inch in thickness of metal, this sustained a pressure of a column 800 feet in height with hardly any swelling, but with 1000 feet it burst The fracture here was not so fine as in the other, the metal being much less ductile. Such is the extreme pressure which these pipes will bear before bursting, but it would be unsafe in practice to subject them to more than one third of this. Still, however, it appears that a two inch pipe, with one fifth of an inch thickness of metal, will be sufficient for withstanding a pressure of 300 feet. Many other examples might be given of the application of these experiments, did our limits permit. We shall just mention, however, an interesting piece of antiquity, which was lately brought from Italy by Professor Leslie; it is a Roman lead pipe, supposed to have been used in conveying water to the baths of one of the Emperors; it is not truly round, but of an irregular oval or flattened shape, the metal appearing to have been turned over longitudanally, without any roller or mandrel, and then strongly soldered. It is as near as we recollect, about 2½ inches diameter one way, and two inches the other, and the metal about three fourths of an inch thick. Now, it is evident from the above experiments, that the strength of this pipe is enormously above what the occasion could require, and this shows the advantage of having accurate experiments to direct the construction of such works.

From the London Mechanic's Magazine.

SHAKSPERIAN SUSPENSION BRIDGES.

The following account of the metamorphosis of one of these bridges, at Allypore, is taken from the Calcutta Gazette:

This curious change was, we understand, effected with ease in a few hours. The result is very interesting, inasmuch as it proves the great facility and economy with which these ingenious structures can be composed and suspended.

It appears that canes, from 100 to 225 feet in length, and from one to nearly two inches in diameter, are procurable on our north eastern frontier, merely for the cost of the labour in collecting them together. The governor general's agent, Mr. Scott, when at Sylhet, sent down to Calcutta, at the request of Mr. Colin Shakspeare, a supply of canes, coiled up like rope; and of which he has constructed the present small bridge, of 130 feet span by 5 feet in width. Not only the roadway, but all the radiating guys, catenary curved swings, preventer braces, and vertical suspenders, are of cane, none exceeding one and a quarter inches in diameter, and many not three quarters of an inch.

The use of iron thimbles throughout the composition gives an air of symmetry and neatness, while they gradually diminish friction, and add much to the strength of the bridge, which, like its rustic predecessor, has only one iron jointed arm in the centre.

The appearance of the arch is singularly light, even more so than rope; and it is in reality lighter as a whole, because the bamboo cross slips, forming the roadway, are lashed at once to the canes, and thus it becomes firmer than in the rope bridge, in which the treadway is distinct, and lies over the strands.

Eighteen canes, of 150 feet each, form the bearings. These are lashed together at each end of the bridge, and then bound round four *open hearts*, in substitution of dead eyes. Thus the setting-up power acts in the same way as with the rope bridge.

There are no friction sheaves in the standards, with the exception of one for the lowest guy, the angle being acute.

The strength and durability of the cane is by some considered equal to that of rope, and this is a question that time will solve. Meanwhile it is quite clear, that if the cane should only last a season or two of the rains, and it is strongest when kept moist, the advantages gained to the country abounding in that useful and cheap commodity, will be incalculable; no bridge whatever, we believe, having been attempted in that quarter up to the present time. And we may conclude, that the natives, from habit and method in working up cane, will improve both on the neatness and strength of the cane bridges now to be introduced, especially as they well know, from experience, how to choose the best kind of cane, and to cut it at the proper season for the purpose intended.

The Right Honourable the governor general visited the cane bridge, and his excellency was pleased, after a minute inspection, to signify his approbation of so novel and useful a structure.

The original experimental Berai Torrent Bridge, still lying at Allypore under cover, was also exhibited to his excellency, preparatory to its return to its station, for the third season of the approaching rains. It is then, we are told, the postmaster general's intention that it shall be accompanied by a new bridge for a torrent a few miles west of Bancoorah.

From the Kaleidoscope.

THE PALACES AND THE HANGING GARDENS OF BABYLON.

At the two ends of the bridge were two palaces, which had a communication with each other by a vault, built under the channel of the river at the time of its being dry. The whole palace which stood on the east side of the river, was thirty furlongs (or three miles and three quarters) in compass near which stood the temple of Belus, of which we shall soon speak. The new palace, which stood on the west side of the river, opposite to the other, was sixty furlongs (or seven miles and a half) in compass. It was surrounded with three walls, one within another, with considerable spaces between them. These walls, as also those of the other palace, were embellished with an infinite variety of sculptures, representing all kinds of animals to the life. Amongst the rest was a curious hunting piece, in which Semirami on horseback was throwing her javelin at a leopard, and her husband Ninus piercing a lion.

In this last, or new palace, were the Hanging Gardens, so celebrated among the Greeks. They contained a square of four plethra (that is, of four hundred feet) on every side, and were carried up aloft into the air, in the manner of several large terraces, one above another, till the height equalled that of the walls of the city. The ascent was from terrace to terrace, by stairs ten feet wide. The whole pile was sustained by vast arches, raised upon other arches, one above another and strengthened by a wall surrounding it on every side, of twenty two feet thickness. On the top of the arches were first laid large flat stones, sixteen feet long, and four broad. Over these was a layer of

reed, mixed with a great quantity of bitumen, upon which were two rows of bricks, closely cemented together with plaster. The whole was covered with thick sheets of lead, upon which lay the mould of the garden. And all this floorage was contrived to keep the moisture of the mould from running away through the arches. The mould or earth laid thereon, was so deep, that the greatest trees might take root in it; and with such the terraces were covered, as well as with all other plants and flowers that were proper for a garden of pleasure. In the upper terrace, there was an engine, or kind of pump, by which water was drawn up out of the river, and from thence the whole garden was watered. In the spaces between the several arches, upon which this whole structure rested, were large and magnificent apartments, that were very light, and had the advantage of a beautiful prospect.

Amytis, the wife of Nebuchadnezzar, having been bred in Media (for she was the daughter of Astygas, the king of that country) had been much taken with the mountains and woody parts of that country. And as she desired to have something like it in Babylon, Nebuchadnezzar, to gratify her caused this edifice to be erected; Diodorus gives much the same account of the matter, but without naming the persons.

FLORIDA CANAL.

The following article on this important subject is from the pen of C. Felch, A. M. of the navy, a practical man, of science and observation. Mr. Felch has gone over the ground; and although we are not informed where he thinks the canal should terminate, yet there is too much information in his remarks to be withheld from the public.

A MEMOIR

On the subject of a *Ship Canal* through the Isthmus of Florida, uniting the waters of the Gulf of Mexico with those of the Atlantic ocean.

Since the splendid achievements of New-York, in the successful completion of her canals, there seems to be an universal excitement upon similar enterprises in every part of the country. It is a characteristic of a free people, to enter with great ardour on all those plans which promise to be of public utility, while they contribute to individual prosperity. That the enthusiasm on the subject of canals may go too far, is very probable.—— That wealthy individuals may lose money in some cases, is also probable. But money expended on public or private works, within the country, is not lost to it. It merely changes owners. Public spirit, or private anticipations, often draw money from the full, strong boxes of the rich, and put it in circulation among the poorer, labouring classes. To say nothing else, it is the best charity, for idleness and vice cannot be divorced. They are joined together by ties as strong as the chains of destiny. He therefore who expends his surplus wealth in endeavours to ameliorate the condition of the community, by encouraging and promoting industry, is the true patriot; and may well laugh at the empty professions of others.

There is one canal in contemplation which cannot but greatly enhance the interests of the whole nation, as well as increase the wealth of those who engage in it, if it should succeed according to the opinions of those best acquainted with the localities of that part of the country through which it is proposed to pass. I mean that canal which will unite the Gulf of Mexico more immediately with the Atlantic ocean, through the Isthmus of Florida. Its importance is universally acknowledged. Its practicability will be, perhaps, somewhat better understood by some observations which I shall make, than by my insulated opinion.

In May, 1822, I was ordered to Florida, by the government, on a survey of that coast, directed by an act of Congress of the 6th of that month. It was not until the ensuing December, that men and means were furnished

for commencing the survey; during this period I devoted considerable attention to making myself acquainted with the topography of the territory, and especially of that part through which the canal is contemplated. I was lead to this from an early impression that one of the great objects of our government, in seeking the acquisition of this interesting territory, was for this special purpose; whether mistaken or not, is immaterial. During the two years I was on that survey I did not lose sight of the subject, and availed myself of every opportunity to acquire information which my duties on the sea board would permit.—According to the best of that information, I will propose and answer several queries.

1. At what point in the Gulf of Mexico should it commence, and where enter the river St. John's: and what is the nature of the country through which it would pass?

It is premised, that in answering this question, I have made no accurate surveys to enable me to arrive at a mathematical certainty, but can speak with some confidence from partial personal knowledge and good information. I am somewhat at a loss, from not having all my data with me; but my notes and recollection may be sufficient for the intentions of the memoir.

1. The Bay of Espirtu Santo, the entrance to which is nearly in lat. 27 deg 38 min. N. long. 33 deg. 20 min. W. On that coast it is a *sine qua non* that there should be good water in approaching it, and at the entrance of the harbour or bay; for in such must be the entrance or mouth of the canal. It is certain that no vessel could approach it on an open beach, even if a gate could be made to stand; which I consider impossible on a sandy shore. There is good water in approaching this bay, and at the lowest tides 23 feet in the entrance. It is a safe harbour, and good anchorage in it with any winds. Proceeding up it, N. by E. 20 miles, to the head of Hilsborough Bay, there are three to ten fathoms water, nearly to the mouth of Hilsborough river, called by the Spanish *Rio de Buffalo*. To this river there is a good entrance, and its direction is towards Lake George, the head of navigation on the St. John's. How far it runs in this direction is not certain. But I am informed by Indian hunters, of intelligence, on the subject, and I believe, of veracity, that they have been in canoes when the water was high, from it into Lake George. I know that there is a considerable stream emptying into the lake from that direction, which has been descended a number of miles in boats. The distance from the mouth of Hilsborough river to the head of the lake, in a direct line, is about 110 statute miles. The country between them is mostly, if not wholly, an everglade, by which is meant a low marsh frequently covered with water, and in which there grows a sharp triangular grass, from ten to twelve feet high and impervious to men or animals. It is said, with what truth is uncertain, that Indian ponies prostrate it with their feet, so as gradnally to make paths.

If a canal should be brought to lake George, there is an obstruction where it unites with the St. John's, not having more than seven feet water at its outlet. But this could probably be deepened, as the bottom is soft mud. But running a little more to the westward, it might be carried directly into the St. John's, into deep water, and the distance would not be increased more than from fifteen to twenty miles.

2. *Cayo de San Martin Cayas de Aguadulce*, and *Punta Cedras*, or *Aligator Point*. About 80 miles N. 3-4 W. from the entrance of Espirtu Santo, the main land appears to terminate, and there commences clusters of innumerable islands, the easternmost of note is San Martin. Between this and the main there are from eighteen to twenty four feet of water, as well as good water for merchant ships off shore. There is also an entrance between this and the Aguaudlces to the west, to which nearly the same remarks will apply.

But between the Aguadulces and

Aligator Point, is the principal entrance, being something like twenty miles wide. But of the 65 miles from whence the inlets commence to Aligator Point, little is known. Mr. Gault, the very accurate English Surveyor, having proceeded from the Mississippi with great minuteness, was here arrested by the Spanish authorities, and not permitted to proceed. The Spanish themselves did not pursue the surveys, and when Mr. Gault again resumed his labours, he began at the Tortugas Our surveys have gone no farther than the Tortugas, and therefore what is known of this sixty miles is from casual observation. How far inland this bay extends, or what depth of water there is in it, is therefore uncertain.

I fear that on examination there will not be found sufficient water.—Three leagues off there is but two fathoms, and the same in the entrance. Notwithstanding, it is hoped that on a minute examination, deeper water may be found, as this appears, from many causes, the best place for egress and ingress, if there be water enough, and a sufficiently capacious harbour. It is highly probable that the entrance east of San Martin communicates with this by a bay back of the Aguadulces. If so, any difficulties in Point Aligator entrance will be obviated.

The distance from Aligator point to Lake George is not far from seventy miles. The Indian hunters say, the *everglades* making from Aligator Bay and Lake George nearly meet. They are of the same nature of those of the Espirtu Santo. The bottom of the everglades is a black, soft vegetable deposit, intermixed with some fine silicious particles, together with some calcarious matter. The foot is only supported by the exceedingly strong fibres of the grass roots.

From Aligator Point to navigable waters, in Wicamaw creek, is about sixty miles. I give its name as I had it from the Indians, not recollecting the Spanish name. This creek has good water, and is wide enough for ships for a considerable distance in a westerly direction from St. John's river. By coming into it, from 20 to 30 miles distance would be saved, and the canal would be most of the route through pine barrens and hummack lands, (meaning those covered with live oak and other hard woods.) The soil is alluvial, composed chiefly of fine white sand, intermixed with a portion of calcarious substances, and vegetable mould, is light and easily moved.

Immediately to the east of Aligator Point is the mouth of the river San Juan, a stream of some note, coming through the uplands, if the term be allowable. It enters between the Point and Pine Islands, from the north, being nearly parallel to the St. John's; it would, I consider, be inexpedient to enter it, but keep to the south of the Islands of Pines to the head of the Bay. Wicamaw Creek is about E. 1-2N. from Aligator Point.

Having got into the St. John's, there are no obstructions, until at its mouth, the bar presents a formidable, and, as I conceive, an insurmountable barrier to ship navigation.

2. Shall the Canal enter the Atlantic at the mouth of St. John's river?

The bar is a quick sand, and extremely treacherous; there is sometimes ten feet on it at low water, but usually only from three to four feet.—The average rise of the tides, deduced from very minute observations, while surveying the harbour and bar in the year 1823, are five feet six inches.—Lumber vessels, drawing from seven to eight feet, have been detained there for weeks, if not months, unable to cross it; the sheet of water at the mouth is so wide, that it would be a Herculean labour to narrow it so much as to deepen the principal channel, if any of the numerous and changing sluices deserve that name. I have sounded and found seven feet, and in two days afterwards, in precisely the same place, fixed by angles, found only two feet, while at the distance of 200 yards, there would be four feet, in a spot which was nearly bare at the first soundings In the intervening time, there had been fresh breezes, and it is open to all the prevailing winds. The bar is so narrow,

and so sensitive, that it is scarcely in human power to control it, or in any manner improve it.

3. At what point should it leave the St. John's, where enter the Atlantic, and though what soils would it pass?

1. Enter Six Mile Creek, just below the old Spanish fort at Picolati, proceed up it the distance which its name purports; then across to St. Sebastian river, enter the southward and westward of St. Augustine, and proceed to sea through the harbour. This was my impression while surveying St. Augustine harbour, and also the adjacent coasts and harbours; and I suggested the project to the gentlemen there, even if the canal went no farther than to the St. John's. It was so seriously contemplated, that Congress was applied to for a grant of public lands through which it might run.

There is sufficient water in Six Mile Creek, and it is wide enough for ships to pass. It terminates in pine barrens, the soil under which is of much the same nature as that between Aligator Point and Wicamaw Creek, only that there is more calcarious substance not so minutely pulverized, and less vegetable matter; in some places there is also considerable alumine.—The water at the mouth of the St. Sebastian and in the upper part of the harbour, is from eight to ten fathoms deep, and there is sufficient water for vessels of any draft to the bar.

On arriving at this point, the same obstacle presents itself as at St. John's, though less formidable, and perhaps not insurmountable; six feet can be depended on at low water.—The average rise of the tides is six feet three inches; the bar is of considerable width, and being sheltered in many parts by St. Anastatia island, is not so subject to changes. North of the light house, on the island, there is an island of considerable extent forming; the upper part abreast of the lighthouse is already 3 or 4 feet bare at common high water; this island has brought the main channel into very narrow limits; from it to Cortel Point is not more than three fourths of a mile, and most of it nearly dry at low water; a great portion of St. Anastatia island is a congregated concretion of marine shells, forming a stone of sufficient tenacity for building, and which hardens either by being exposed to the air, or submerged under water. Now I propose to take this concretion, and fill up the space between Cortel point and the new island. The material being at hand, the expense cannot be great; there are ten times the quantity sufficient on that part of the island belonging to the general government, and which is now useless. The idea that the city would be more endangered in a gale of wind, to my my mind is erroneous; it would be forming a protection in that point from which it is most to be apprehended, and from which most was felt in the gale of last August. Or if, on investigation, any danger were to be apprehended by a removal from the public land, let them be procured from the private property farther eastward. But no evil has been experienced from the removal of the immense quantities which have been employed in building the fort, public buildings, wharfs, and most of the private houses in the city.

By turning all the water through the principal channel, the water on the bar might inevitably be increased, and in a proper place will be shown how it may be farther increased by water from the St. John's, through the proposed canal.

[*To be continued.*]

BLACK ROCK HARBOUR.

The following correspondence appeared in the B. R. Gazette of the 3d instant. Mr. Roberts has been one of the principal engineers on the Erie Canal from the beginning. He has been distinguished for his unwearied and constant attention to the duties of his office, and no portions of the great work are better done, probably, than those on which he has been stationed. The testimony, therefore, given in his letter, comes with peculiar weight, and is calculated to

quiet those apprehensions for the security of the works at Black Rock, which on account of the deep interest of the public in them have excited no little solicitude in all parts of the state, from Buffalo to New-York.

N. S. ROBERTS. Esq.

SIR,—Some of my friends, having learnt that you had recently a thorough and particular examination of the Public Works at this place, desire me to obtain from you, your opinion of those works, resulting from such examination, whether they have sustained any injury from the late extraordinary storms? Whether there are any grounds for the numerous tales, which have been published concerning those works? and whether they do not now exhibit solidity and strength equalling the expectations of the canal commissioners and engineers, entertained during their incipient progress?

Your most obedint servant,
S. H. SALISBURY.

Black Rock, Dec. 19, 1825.

S. H. SALISBURY, Esq.

SIR,—In compliance to your letter of the 19th inst. I have the pleasure of communicating to you the following remarks.

As the various works composing Black Rock Harbour, are nearly completed it has been my duty to accompany Col. Bouck, canal commissioner, for the purpose of a close and particular examination of all parts of the harbor, from the ship lock to Bird Island, a few days after the late extraordinary storms on Lake Erie: and I have the satisfactory consolation to state, that those works are not in the least injured or disturbed by the late storms, but that, to all appearances, the fullest confidence may be placed in their solidity and strength, equal, and perhaps superior, to the most sanguine expectations heretofore entertained by the canal commissioners and engineers.

The current in the Harbour is only objectionable, and this my be effectually overcome, by a few thousand dollars, laid out in gravelling the pier, as those parts of the pier already gravelled, are almost palpably tight,) and by removing the safety dam.

The dam and ship lock, at the lower end of the harbor, sustains a permanent head of nearly five feet of water. The ship lock is in good condition, and schooners of the largest class may pass through in 8 or 10 minutes.

The water in the canal from Black Rock Harbor to Lock port, has been uniformly five and a half feet deep, since the 26th of October; and a copious supply has been constantly discharged through the waste waters, at the latter place, sufficient to feed the canal (to overflowing) during the dryest season of the year, to the Cayuga marshes. The public works at Lockport present to the view of the observer, every appearance of strength, solidity, and elegance of workmanship for which they have been so much admired by the most competent judges; and not the least appearance of any unusual defect in their structure or permanancy can be discovered, though they have been constantly in use since the grand celebration.

I am, Sir, with much respect and esteem, your obedient servant,

N. S ROBERTS,
Principal Engineer.

Lockport, Dec. 24. 1825.

BOTANICAL OBSERVATIONS.

The vicious material which surrounds the stalks under the flower of the plant called the catchfly, is a contrivance to prevent various insects from plundering the honey or eating the seed. In the *dionæa muscipulæ* there is still a more wonderful contrivance to prevent the depradations of insects; the leaves are armed with long teeth, like the *antannæ* of insects, and lie spread upon the ground round the stem, and are so irritable that, when an insect creeps upon them, they fold up, and crush or pierce it to death. The flower of the *arum muscivorum* has the smell of carrion, by which flies are tempted to lay their eggs in the chamber of the flower, but in vain endeavour to escape, being prevented by the hairs pointing inwards, and thus perish in the flow-

er; hence the name of fly-eater. In the *dypsacus* is another curious contrivance for this purpose; a basin of water is placed round the point of each stem. In the *drosera* is also another kind of fly-trap.

NEW SCARLET COLOUR.

A Mr. Badams has recently described a process for obtaining scarlet chromate of lead, and highly recommends its use as a colour either in painting or calico printing. He prepares the scarlet chromate by boiling yellow chromate of lead with potash, and has made several experiments upon the scarlet colour thus obtained.—It appears that it may be made what is termed a fast colour in calico printing, and that it is a durable and beautiful colour when used with oil, possessing considerable body. It is not degraded in its hue by admixture with white lead, as vermilion is; and it also mixes with other colours. As a water colour it has not been sufficiently tried to render it certain that it will not blacken; but several slips of card and thin paper painted with it, and hung up in situations likely to affect colour, have not in some months diminished in brightness. Mr. Badams very justly remarks, that should it succeed, no tint would be a more desirable accession to the pallet than a bright and permanent scarlet, or a scarlet orange.

GYMNOTUS, OR ELECTRIC EEL.

This singular fish is a native of the river of Surinam, in South America; in their native country they are said to exceed twenty feet in length, and to kill any man who approaches them in a hostile manner. It is not only to escape its enemies that this surprising power of the fish is used, but also to take its prey, which it does by benumbing them, and then devouring them before they have time to recover; or by killing them; for the quantity of power seems to be determined by the will or anger of the animal, as it sometimes strkes the fish twice before it is sufficiently benumbed to be easily swallowed. The organs productive of this accumulation of electric matter have been accurately dissected and described by Mr. J. Hunter, in vol. 6 of the 'Philosophical Transactions.'

EXTRAORDINARY BRIDGE.

One of the most extraordinary bridges in Great Britain is that over the river Taff, near Llantrissent, in Glamorganshire, called in Welsh *Pont y ty Prydd*. This was the work of William Edwards, an uneducated mason of the country, who was only indebted for his skill to his own industry and the power of his genius. He had engaged, in 1746, to build a new bridge at this place, which he executed in a style superior to any thing of the kind in this or any part of Wales, for neatness of workmanship and elegance of design. It consisted of three arches, elegantly light in their construction, and was admired by all who saw it. Unfortunately a great flood which occurred drifted down a quantity of timber against the bridge. In consequence of this obstruction to the flood, a thick and strong dam, as it were, was formed. The aggregate of so many collected streams being unable to get any farther, rose here to a prodigious height, and with the force of its pressure carried the bridge entirely away before it. William Edwards had given security for the stability of the bridge for seven years; it had stood only two years and a half. Of course he was obliged to erect another; and he proceeded on his duty with all possible speed. The second bridge was of one arch, for the purpose of admitting freely under it whatever incumbrances the floods might bring down. The span or chord of this arch was 140 feet, its altitude 35 feet, the segment of a circle whose diameter was 170 feet. The arch was finished, but the parapets not yet erected, when, such was the pressure of the unavoidably ponderous work over the haunches, that it sprung in the middle, and the key stones were forced out. This was a

severe blow to a man who had hitherto met with nothing but misfortune in an enterprise which was to establish or ruin him in his profession. William Edwards, however, possessed a courage and a confidence in his powers which never forsook him; he engaged in the work a third time, and, by means of cylindrical holes through the haunches, so reduced their weight, that there was no longer any danger from it. The second bridge fell in 1751; the third, which has stood ever since, was completed in 1761. The present arch is 140 feet in span, and 35 feet high, being the segment of a circle of 175 feet in diameter. In each haunch there are three cylindrical openings running through from side to side; the diameter of the lowest is nine feet: of the next, six feet; and of the uppermost, three feet. The width of the bridge is about eleven feet. To strengthen it horizontally, it is made widest at the abutments, from which it contracts towards the centre.

LIGHTING STEEPLE CLOCKS.

The faces of a Steeple Clock, illumined by gas, may be rendered equally readable by the inhabitants in the night as in the day; this has now, for some years, been exemplified at the Tron Church, in the City of Glasgow. A gas-lantern, whose exterior (except on the side next the steeple, where it is glazed) tastefully represents the bird called the *phœnix*, is supported at several feet distant from and level with the upper part of the clock-face, by two supporters acting braceways to each other, and steadied, laterally, by two chains proceeding from the corners of the steeple; the main of these supports is the gas-pipe, which supplies the lantern, and the other is also a gas-pipe used for lighting the lantern. It effects this by means of numerous equidistant small holes, or narrow cross slits in its side, and is called the *flash-pipe*. At sun-set, when the lantern is to be lighted, the lamp-lighter, by means of cocks fixed within his reach in the street, turns the gas into both these pipes, and, after waiting a proper time for the gas to ascend to the lantern, he applies his flambeau to the jet of gas issuing from the lowest of the holes in the flash-pipe, the flame from which instantly communicates to the jet next above it, and so on, until in a few moments this chain of flame enters the lantern, and lights the burner of the main pipe, which being perceived by the illumination on the clock face, the flash-cock is then turned off, and no farther attendance is needed until about sunrise, when the other cock is shut off, and this clock-lantern extinguished, in its turn, with those in the adjacent street. The lantern is curiously glazed, convexly, in five panes; and a number of plain mirrors are, concavely, fixed behind the burner, to act as a reflector in throwing the light principally on the clock-face.

HOW TO RESTORE THE COLOUR OF WOOLLEN CLOTHS DISCHARGED BY AN ACID.

SIR,—Having accidentally spilled some strong solution of oxalic acid on a pair of black trowsers, the colour was discharged, and the place, which was large, turned of a yellow colour. The following day I dissolved some pearlash in water, with the addition of an equal portion of quick lime and sponged the part with it. The alkali rendered the stain and the adjacent part, which was wetted, of a dark foxy brown; a little vinegar, now applied, restored all to its pristine black, and I defy the most experienced scrutinizing Hebrew to discover the place.

I remain Sir,
Your obedient servant, ALKALI.

COTTON.

Charleston, Jan. 9th.

Sea Island continues nominal—Santees and Maines have sold at 32 cents: the quantity in market is limited—Uplands have receded, and sales effected were principally at 13 1-4—nearly the whole stock, except those which are stored by order, has gone off during the week.

VARIETY.

From Various Papers.

A most remarkable circumstance lately took place at the house of Mr. Philpot, fruiterer, Great Mary la bonne street, Manchester square, London. James Martin, a fine little boy about five years of age, son to a coachman who occupies the third floor apartment in the above house, was left at home by his parents, under the care of his sister, a girl about fourteen years of age, who, having occasion to go out, left the little urchin in the room. During her absence he locked the door of the apartment, and on her return refused to open the door for her: she requested him repeatedly to put the key under the door, thinking he was not able to unlock it; but he told her he was going to throw himself out of the window: she paid no attention to his threat, but he said, here goes, on which he threw out a pair of pincers that were in the room. Mrs. Philpot happened to be speaking to a female on the pavement opposite the door, and seeing the pincers fall, she said what a shame it was to be throwing such things out of the window, and on looking up she saw something else falling, which proved to be the key of the room: on looking up at the third floor window, whence it was thrown they saw something white, on which Mrs. Philpot observed, here comes a bundle of rags. She had no sooner uttered the words than the child was seen falling from the window, and her friend exclaimed, 'My god! it is a child!' Mrs. Philpot, who is a stout woman, was rivetted to the spot through the shock she received; and, fortunately, the child, instead of falling on the stones, fell on her left breast and shoulder, with its arm round her neck, and slipped off to the pavement, its head falling but lightly on the stones. Mrs. Philpot was considerably hurt by the child falling on her. The child was stunned. It was immediately carried to Dr. Burnett's, of Mary la bonne street, who applied leeches, and restored it to its senses, and it was taken home and put to bed, and was not spoken to all night. The next morning, however, at the usual hour for his parents to breakfast, he called for it, and ate with a good appetite; and, on being spoken to on the subject of his descent, he laughed, saying, I'll do it again. He is now playing about the streets as cheerfully and pleasant as ever he was in his life. He has not a single bruise, with the exception of one on his forehead, on which he fell, and that is slight.

An auctioneer, at a late sale of *antiques*, put up a helmet, with the following candid observation:—This, ladies and gentlemen, is a helmet of Romulus, the Roman founder—but whether he was a brass or iron founder I cannot indeed tell.

The following ingenious mode of catching fish is said to be practised by the Chinese;—To one side of a boat a flat board, painted white, is fixed, at an angle of about 45 degrees, the edge inclining towards the water. On moonlight nights the boat is so placed that the painted board is turned to the moon, from whence the rays of light, striking on the whitenned surface, give to it the appearance of moving water, on which the fish being tempted to leap, as in their own element, the boatman, raising the board with a string, turns the fish immediately into the boat.

The cotton gin of Capt. S. H. Sprigg, about four miles from Alexandria, Louisiana, was destroyed by fire on the 13th ult. together with about 130,000 pounds of seed cotton. On the Sunday previous, the dwelling house of Mrs. Rose Marshal was burnt down, and all its contents.

Intelligence lately reached town that the steam boat Grecian suddenly sunk last Sunday night, whilst taking in cotton at Fort Adams. We learn that most of her cargo will be saved.

We have since learned that the Grecian has been got up.

Dogs are exceedingly useful in the low country, and it is not rare to meet whether at Tournay or at Maubeuge, heavy carriages drawn by them.—Such is the stength and swiftness of those raised in that country, that they excel horses in the race, of which we are about to mention an instance.

John Richard Caribouffe, a rich butcher, of Lisles, in Flanders, had six dogs of an extraordinary breed, uncommonly large, with voices as loud as those of bulls, and with such strength that they carried with ease several butts of wine placed upon a dray. A mad bull could not intimidate them—they attacked him in front, and annoyed him until he retired from the field.

Celebrated for their strength and swiftness, the dogs of Caribouffe became in general repute. As he was driving them one morning in his calash, he fell in on the road with the Prince de Ligne's carriage—and, animating his dogs, he passed and repassed repeatedly his Highness's carriage for upwards of two hundred yards. Astonished to see horses outrun by dogs, the Prince inquired of the butcher if they could perform as well for the space of half a league.

Quite elated at having attracted the notice of the Prince, the butcher answered that half a league was a mere trifle—that his dogs could travel full gallop over a much greater distance, and that if he wished, he would bet a hundred louis that they would beat the Prince's horses for the distance of three leagues. The challange was accepted, and on the day appointed, it is needless to say that an immense multitude from all parts of the country repaired to the scene of this singular spectacle.

Having well fed his six dogs, Caribouffe was punctual to the rendezvous, and, at the appointed signal, started with the Prince's equerry, who drove a phæton, drawn by six elegant horses. The butcher, notwithstanding his corpulence, quickly passed in his calash the mettlesome horses, and arrived at Tournay fifteen minutes before his antagonist, thus gaining two thousand four hundred livers in less than an hour.

While men extol such exploits, they should not abuse the faithful animals that perform them; yet in Paris, you frequently see them panting and exhausted with carrying weights far beyond their strength.

METEOROLOGICAL TABLE.

	Thermometer 8 in the morn	Thermometer noon	Thermometer 10 at night	Remarks
Jan. 14—Saturday	44°	53°	50°	rain
15— Sunday	51	54	40	clear
16—Monday	31	32	28	clear
17—Tuesday	28	39	27	clear
18—Wedns'y	30	36	31	clear
19—Thursday	33	41	29	clear
20—Friday	30	34	32	clear

Communications for the 'American Mechanics' Magazine' post paid, and addressed to

C. S. WILLIAMS,

No. 252 Broadway, will receive due attention.